

CLAIMS

What is claimed is:

1. A wafer for characterizing a chemical mechanical polishing process, comprising:
 - a layer;
 - a first electrical resistance member embedded in the layer, the first electrical resistance member having an electrical resistance which changes with a stress change in a first direction.
2. The wafer of claim 1, further comprising a second electrical resistance member substantially orthogonal to the first electrical resistance member, the second electrical resistance member having an electrical resistance which changes with a stress change in a second direction.
3. The wafer of claim 2, further comprising a third electrical resistance member substantially orthogonal to the first electrical resistance member and the second electrical resistance member, the third electrical resistance member having an electrical resistance which changes with a stress change in a third direction.
4. A system for characterizing a chemical mechanical polishing process, the system comprising:
 - a wafer comprising one or more layers associated with one or more electrical resistance members; and
 - an electrical resistance monitoring system operable to read one or more electrical resistances from the one or more electrical resistance members, the electrical resistance monitoring system further operable to determine wafer stress based at least in part upon the one or more electrical resistances, the electrical resistance monitoring system further adapted to characterize the chemical mechanical polishing process.

5. The system of claim 4 wherein the one or more electrical resistance members located at least one of on and in at least one of a polysilicon layer and a dielectric layer.
6. The system of claim 4, the one or more electrical resistance members located at least one of on and in a substrate.
7. The system of claim 4, the electrical resistance members comprising a first electrical resistance member and a second electrical resistance members, the first electrical resistance member substantially orthogonal to the second electrical resistance member.
8. The system of claim 7, the electrical resistance members further comprising a third electrical resistance member substantially orthogonal to the first electrical resistance member and the second electrical resistance member.
9. The system of claim 4, one or more electrical resistance members arranged at least one of linearly, circularly, in a matrix, randomly and in a pattern.
10. The system of claim 4, the wafer comprising at least one of a signal processing circuitry, a power source and an electrical resistance processor.
11. The system of claim 4, the wafer further comprising one or more fabricated features.
12. The system of claim 4, the electrical resistance monitoring system operable to read the one or more electrical resistance at least one of before, during and after the chemical mechanical polishing process.
13. The system of claim 4, further comprising a data store adapted to store electrical resistance information.

14. The system of claim 13, the electrical resistance information comprising at least one of a starting electrical resistance, one or more electrical resistances recorded at one or more times during the chemical mechanical polishing process, one or more electrical resistance recorded after one or more passes of a polishing pad during the chemical mechanical polishing process and one or more electrical resistance recorded after one or more percentages of the one or more layers have been removed during the chemical mechanical polishing process.

15. The system of claim 13, the data store further adapted to store at least one of pad information, slurry information, pressure information and motion information.

16. The system of claim 15, the pad information comprising at least one of the number of wafers polished with a pad and the stiffness of the pad.

17. The system of claim 15, the slurry information comprises at least one of the solids concentration in the slurry, the components of the slurry, the pH of the slurry, the dispensing rate of the slurry, the particle size of the slurry and the particle density of the slurry.

18. The system of claim 15, the pressure information comprises at least one of an initial pressure, an average pressure, a minimum pressure and a maximum pressure.

19. The system of claim 15, the motion information comprises at least one of a motion type, an initial speed, an average speed, a minimum speed and a maximum speed.

20. The system of claim 15, the electrical resistance monitoring system comprising a relater adapted to produce a relation between at least one of the pad information, the slurry information, the pressure information, the motion information and the electrical resistance information.

21. The system of claim 20, further comprising a control system having an initializer adapted to facilitate initializing at least one of a chemical mechanical polishing process and apparatus based, at least in part, on at least one of the electrical resistance information, the pad information, the slurry information, the pressure information, the motion information and one or more relations between the electrical resistance information, the pad information, the slurry information, the pressure information and the motion information.

22. The system of claim 21, the control system comprising a controller adapted to control at least one of a chemical mechanical polishing process and apparatus based, at least in part, on at least one of the electrical resistance information, the pad information, the slurry information, the pressure information, the motion information, one or more relations between the electrical resistance information, the pad information, the slurry information, the pressure information and the motion information and an incoming monitored electrical resistance data.

23. A method for characterizing a chemical mechanical polishing process, the method comprising:

- associating one or more electrical resistance members with a wafer;
- chemically mechanically polishing the wafer;
- gathering one or more pieces of electrical resistance information related to the chemical mechanical polishing process from the one or more electrical resistance members; and
- analyzing the one or more pieces of electrical resistance information to characterize the chemical mechanical polishing process.

24. The method of claim 23 wherein the one or more pieces of electrical resistance information are gathered from the one or more electrical resistance members at least one of before, during and after chemically mechanically polishing the one or more wafers.

25. The method of claim 24 wherein the electrical resistance information comprises at least one of a starting electrical resistance, one or more electrical resistances recorded at one or more times during the chemical mechanical polishing process, one or more electrical resistances recorded after one or more passes of a polishing pad during the chemical mechanical polishing process and one or more electrical resistances recorded after one or more percentages of one or more layers have been removed during the chemical mechanical polishing process.
26. The method of claim 23 comprising gathering at least one of pad information, slurry information, pressure information and motion information associated with the chemical mechanical polishing process.
27. The method of claim 26, the pad information comprising at least one of the number of wafers polished with a pad and the stiffness of the pad.
28. The method of claim 26, the slurry information comprising at least one of the solids concentration in the slurry, the components of the slurry, the pH of the slurry, the dispense rate of the slurry, the particle size of the slurry and the particle density of the slurry.
29. The method of claim 26, the pressure information comprising at least one of an initial pressure, an average pressure, a minimum pressure and a maximum pressure.
30. The system of claim 26, the motion information comprising at least one of a motion type, an initial speed, an average speed, a minimum speed and a maximum speed.
31. The method of claim 23, further comprising producing a relation between at least one of the pad information, the slurry information, the pressure information, the motion information and the electrical resistance information.

32. The method of claim 31, further comprising initializing at least one of a chemical mechanical polishing process and apparatus based, at least in part, on at least one of the electrical resistance information, the pad information, the slurry information, the pressure information, the motion information and one or more relations between the electrical resistance information, the pad information, the slurry information, the pressure information and the motion information.

33. The method of claim 32 comprising controlling at least one of a chemical mechanical polishing process and apparatus based, at least in part, on at least one of the electrical resistance information, the pad information, the slurry information, the pressure information, the motion information, an incoming monitored electrical resistance data and one or more relations between the electrical resistance information, the pad information, the slurry information, the pressure information, the motion information and the incoming monitored electrical resistance data.

34. A system for characterizing a chemical mechanical polishing process, the system comprising:

- means for determining stresses of a wafer during a chemical mechanical polish process;
- means for analyzing the stresses of a wafer during a chemical mechanical polish process; and
- means for initializing a chemical mechanical polishing process based, at least in part, on the analysis of the stresses of a wafer during a chemical mechanical polish process performed by the means for analyzing the stresses.

35. A system for controlling a chemical mechanical polishing process, the system comprising:

- a wafer comprising one or more layers associated with one or more electrical resistance members; and
- an electrical resistance monitoring system operable to read one or more electrical resistances from the one or more electrical resistance members, the electrical resistance monitoring system further operable to determine wafer stress based at least

in part upon the one more electrical resistances, the electrical resistance monitoring system further adapted to control the chemical mechanical polishing process.

36. The system of claim 35 wherein the one or more electrical resistance members are located at least one of on and in at least one of a polysilicon layer and a dielectric layer.

37. The system of claim 35, the one or more electrical resistance members located at least one of on and in a substrate.

38. The system of claim 35, the electrical resistance members comprising a first electrical resistance member and a second electrical resistance members, the first electrical resistance member substantially orthogonal to the second electrical resistance member.

39. The system of claim 35, the wafer comprising at least one of a signal processing circuitry, a power source and an electrical resistance processor.

40. The system of claim 35, the electrical resistance monitoring system operable to read the one or more electrical resistance at least one of before, during and after the chemical mechanical polishing process.

41. A method for controlling a chemical mechanical polishing process, the method comprising:

associating one or more electrical resistance members with a wafer;

chemically mechanically polishing the wafer;

gathering one or more pieces of electrical resistance information related to the chemical mechanical polishing process from the one or more electrical resistance members; and

analyzing the one or more pieces of electrical resistance information to control the chemical mechanical polishing process.